

Design of Girder and Girderfeet for SwissFEL Linac Components

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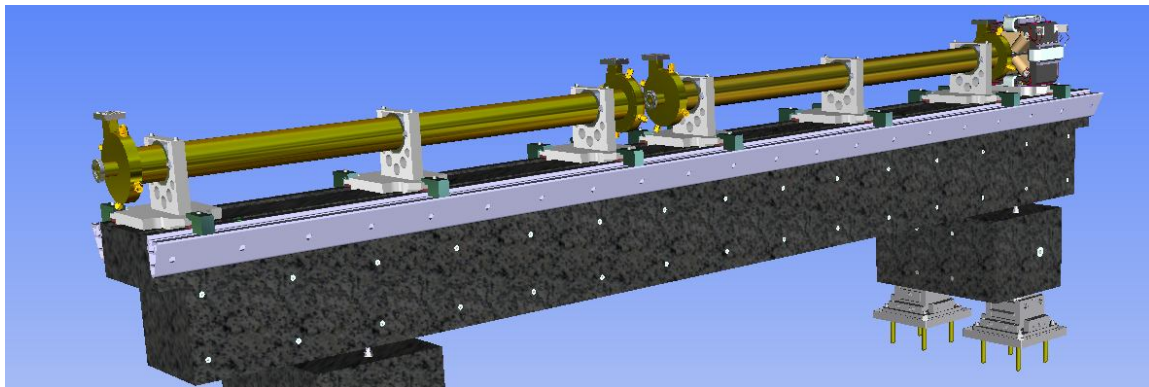
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1-General Concept

The SwissFEL girder design is conceived as an “optical table” which allows several components to be aligned with respect to one reference. The girder itself is then positioned on manually adjustable jacks. Each jack is mounted on a steel plate which is cemented to the floor. The modular supports for components are mounted on the girder's reference surfaces and can be individually aligned.



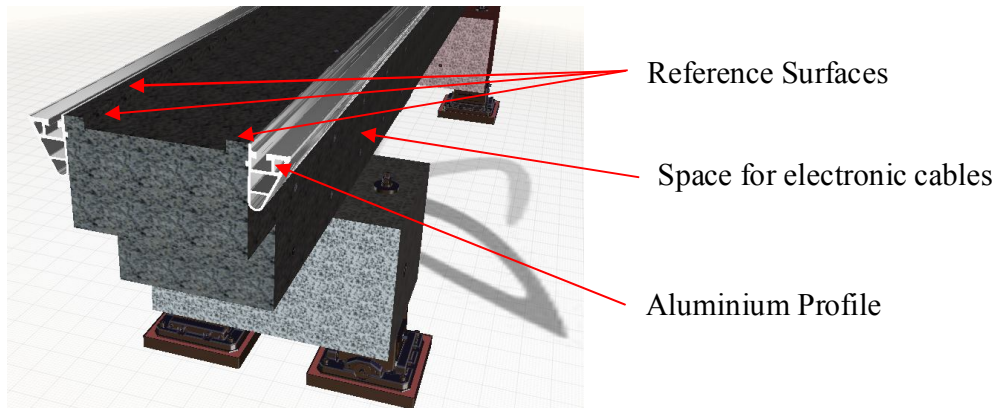
Picture 1: Girder from SwissFEL Project with two C-Band Cavities and a quadrupole

2-Girder

The 4-meters-long girder is made of a monolithic granite block.

The girder has high-precision reference surfaces for direct vertical and horizontal positioning of components.

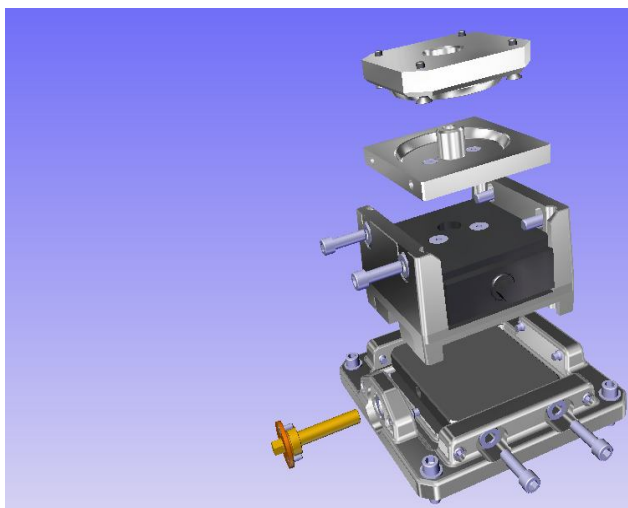
On each side, an aluminium profile with integrated T-Slot is mounted to fix the fasteners. Beyond these aluminium profiles are open-plan surfaces for the installation of electronic cables.



Picture 2: Girder

3-Girderfeet

The relative position of the girder is controlled by using jacks. The design of the jack is consistent with the high eigenfrequencies of the girder; therefore the jack design relies on large surface contact. Screws or spindles in the structure that would generate a weak point for vibrations are avoided. The design uses commercial leveling wedges with for vertical adjustment and screws for horizontal adjustment.



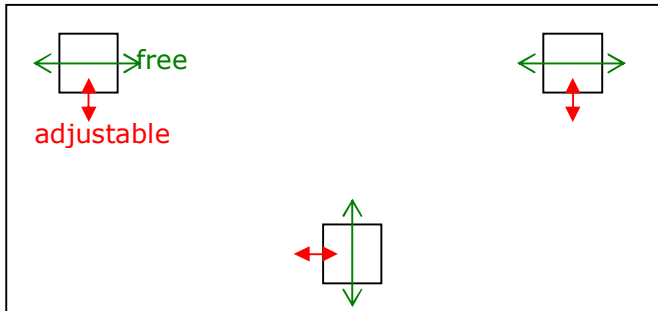
Commercial wedge for the adjustment of the height

Before fixation, one direction is free. The other direction is adjustable with a screw

After the adjustment of the girder, the whole jack is fixed with screws, so that it will behave like a compact block.

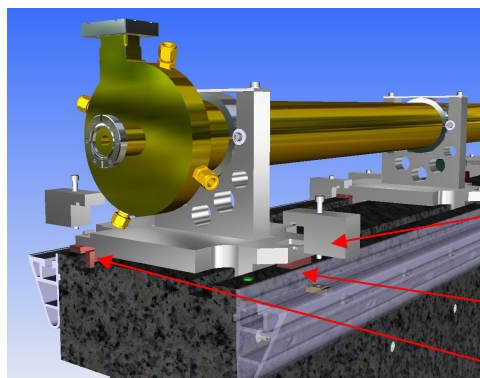
For a girder with four jacks, the adjustment screw has to be removed in one jack, so that this one will be free in two direction.

Example for Support with 3 jacks:



4-Local Support System

For the alignment of components, single adjustable supports are used. These supports can be placed directly on the horizontal and vertical reference surfaces of the girder. Fine adjustment of each support will be performed using shimming techniques.



Support is clamped with brackets

3 shimming plates for vertical adjustment

2 shimming plates for lateral adjustment

Vibration Measurements

The measurements on the first prototype result in

RMS displacement of Floor vertical	:12.2 nm
RMS displacement of Girder Middle vertical	:15.1 nm
RMS displacement of Girder End	:19.2 nm

